

A TAXONOMIC REVISION OF THE GENUS *DURANTA* L. (VERBENACEAE)* IN AUSTRALIA

Ahmad Abid Munir

State Herbarium, Botanic Gardens, North Terrace, Adelaide, South Australia 5000

Abstract

A taxonomic revision of *Duranta* L. in Australia is presented. One naturalised species *D. erecta* (= *D. repens* and *D. plumieri*) is recorded from Australia. Affinities and distribution are considered for the genus and the species. A detailed description of the species is supplemented by a habit sketch of a flowering branch, analytical drawings of the flower and range of variation in shape of leaves.

Taxonomic history of the genus

The genus *Duranta* was described by Linnaeus (1753) with two species, *D. erecta* and *D. repens*, the types of which came from South America. It was placed in the group "Didynamia Angiospermia" where it was retained by Jacquin (1760, 1763), Murray (1774), Reichard (1778), Schreber (1791), Gmelin (1792), Persoon (1797, 1807), Willdenow (1800), Sims (1815), Ker (1817), Link (1822), Sprengel (1825), Dietrich (1842), and a few others. Adanson (1763) placed the genus in Section "II" of "Verbenae", Gleditsch (1764) in "Petalostemonum", Ruling (1774) in "Ringentes Antirrhina", Scopoli (1777) in "Personatae", Gaertner (1788) in "Plumieri", Jussieu (1789) in "Vitices", Necker (1790) in "Plasyrgophytum", Giseke (1792) and Batsch in "Personatar", Ventenat (1799) in "Pyrenaceae", and Reichenbach (1828) under the tribe "Verbeneae" in the Labiatae. In 1805, Jaume Saint-Hilaire proposed the family Verbenaceae for *Duranta* and other related genera. The family Verbenaceae was accepted for the genus by de Jussieu (1806), Kunth (1818), Bentham (1839, 1870, 1876), Endlicher (1838), Lindley (1847), Schauer (1847), Briquet (1895), Bailey (1906, 1913), H.J. Lam (1919) and by the majority of other botanists.

In 1829, Dumortier divided the Verbenaceae into two tribes: Verbeneae and Viticeae, with *Duranta* in the tribe Verbeneae. This tribe was accepted for the genus by Bartling (1830), Spach (1840), Schauer (1847), Grisebach (1862), Harvey (1868), Bentham (1876), Th. Durand (1888), Post & Kuntze (1904), Bailey (1906, 1913), Fletcher (1938), Lemée (1943) and others. Endlicher (1838) divided the family Verbenaceae into three tribes: Lippieae, Lantaneae and Aegiphileae, with *Duranta* in the tribe Lantaneae. This tribe was accepted for the genus by Meisner (1840), Endlicher (1841), Dietrich (1842), Brongniart (1843), Walpers (1845) and Sanders (1984). Bentham (1839) divided the Verbenaceae into four tribes: Verbeneae, Duranteae, Viticeae and Avicennieae, with *Duranta* in the tribe Duranteae. Subsequently, Bentham (1876) transferred the genus *Duranta* to the tribe Verbeneae. Schauer (1847) subdivided the tribe Verbeneae into seven subtribes: Spielmannieae, Monochileae, Casselieae, Verbeneae, Lantaneae, Duranteae and Petreeae, with *Duranta* in the subtribe Duranteae. The subtribe Duranteae was accepted for the genus by Bocquillon (1863).

Briquet (1895) reclassified the Verbenaceae and upgraded the tribe Verbeneae to a subfamily Verbenoideae. The latter consisted of six tribes: Euvrbeneae, Lantaneae, Monochileae, Petraeeae and Citharexyleae, with *Duranta* in the tribe Citharexyleae. This classification was adopted by Dalla Torre & Harms (1904), Lam (1919), Junell (1934),

* The present treatment of the genus *Duranta* is the fourteenth in the series of taxonomic revisions in the family Verbenaceae in Australia. (See Munir, 1982, 1984a, 1984b, 1985, 1987a, 1987b, 1989, 1990a, 1990b, 1991, 1992, 1993a, 1993b.)

Moldenke (1959, 1971, 1980, 1983), Melchior (1964), Lopez-Palacios (1977), Raj (1983) and several others. The majority of botanists, however, have retained the genus in the Verbenaceae without reference to any subfamily or a tribe. In the present treatment, Briquet's (1895) classification of the Verbenaceae is followed in retaining *Duranta* in the tribe Citharexyleae.

Australian history of the genus

The first Australian records of naturalised *Duranta* were collected by Amalie Dietrich during 1863–1865, from near the Brisbane River, Queensland. Then more specimens were collected from the same area by K. Domin during 1910, C.E. Hubbard during 1930, S.T. Blake during 1931 and C.T. White during 1942. Recently, more collections have come from Stradbroke Island, Cape Hillsborough, Cairns and several other localities in Queensland.

In Northern Territory, naturalised *Duranta* was collected by C.E.F. Allen during 1919 and in South Australia it was recorded by R. Bates during November 1988.

The first written record of this genus in Australia was published by Bailey (1888) when he recorded the only known naturalised species of this genus *D. plumieri* (now synonym of *D. erecta*). Later, Bailey (1906) noted it as one of the "suspected poisonous plants of Queensland", and in 1913 he included it in his "Comprehensive Catalogue of Queensland Plants". Subsequently, Domin (1928) recorded the above species in his "Beiträge zur Flora und Pflanzengeographie Australiens" and Webb (1948) mentioned it in his "Guide to the Medicinal and Poisonous Plants of Queensland". Recent records of *Duranta* from Australia were enumerated by Moldenke (1959, 1971, 1980, 1983), Lord & Willis (1982), Stanley (1986), Hnatiuk (1990), Chapman (1991) and Smith (1991). It appears from the above publications, that the process of naturalisation of *Duranta* in Australia has been probably slow and mainly recent.

Chromosome numbers

Chromosome counts for *Duranta* are available from at least nine sources. All are based on counts of *D. erecta* (= *D. repens* and *D. plumieri*). These counts are based on material from outside Australia. The highest count ($2n = 36$) was reported by Darlington & Wylie (1955), Caro (1956), and Fedorov (1974), and the lowest count ($2n = 16$) by Hsu (1967). Diploid numbers of 24 and 32 were also recorded by Fedorov (1974). Others, Sharma & Mukhopadhyay (1963), Koul et al. (1976b), Bir & Sidhu (1976), Coleman (1982) and Gill et al. (1983) reported the diploid number to be 34. Counts for no other species have been seen.

DURANTA L.

Duranta L., Sp.Pl. edn 1, 2 (1753) 637; Gen. Pl. (1754) 284, No. 704; Jacq., Enum. Pl. Carib. (1760) 26; Jacq., Select. Stirp. Amer. Hist. (1763) 186; L., Gen. Pl. edn 4 (1764) 324, No. 786; Mill., Gard. Dict. edn 8 (1768) sphalm. "Durantia"; Giseke, Prael. Ord. Nat. Pl. (1792) 486; Willd., Sp. Pl. 3 (1800) 380, No. 1197; J. St.-Hil., Expos. Fam. Natur. 1 (1805) 249; Juss., Ann. Mus. Hist. Nat. Paris 7 (1806) 75; Kunth in Humb., Bonpl. & Kunth, Nov. Gen. & Sp. Pl. 2 (1818) 253; Rchb., Consp. Veg. 1 (1828) 117, No. 2909; Dumort., Fam. Pl. (1829) 22; Bartl., Ord. Pl. (1830) 180; Endl., Gen. Pl. 1 (1838) 637, No. 3709; Spreng., Gen. Pl. 2 (1831) 480, No. 2371; Meisn., Pl. Vasc. Gen. 1 "Tab. Diag." (1840) 290; 2 "Commentarius" (1840) 199; Endl., Ench. Bot. (1841) 312; D. Dietr., Synop. Pl. 3 (1842) 372; Walp., Rep. Bot. Syst. 4 (1845) 78; Schauer in A. DC., Prod. 11 (1847) 615; Benth. in Benth. & Hook.f., Gen. Pl. 2 (1876) 1150; Briq. in Engl. & Prantl, Pflanzenfam. 4, 3a (1895) 159; F.M. Bailey, Weeds & Suspect. Poison. Pl. Qld (1906) 142; Compr. Cat. Qld (1913) 382; H.J. Lam, Verbenac. Malay. Archip. (1919) 27; Britton & P. Wilson, Sci. Surv. Porto Rico & Virgin Isl. 6 (1925) 146; Moldenke, Lilloa 4 (1939) 313; Publ. Carnegie Inst. Wash. No. 522 (1940) 196; Lemée,

Dict. Desc. Syn. Pl. Phan. 8b (1943) 652, sphalm. "Durantea"; Caro, Revista Argent. Agron. 23 (1956) 3; J.F. Macbr., Field. Mus. Nat. Hist. Bot. Ser. 13, Part 4 (1960) 681; Britton, Fl. Bermuda, Facs. of edn 1918 (1965) 316; D.N. Gibson in Standl. & L.O. Williams, Fl. Guatemala, Fieldiana Bot. 24, Part 9 (1970) 199; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 424, 474, 477, 487, 490, 491, 527, 756, 876; Ann. Missouri Bot. Gard. 60 (1973) 87; Lopez-Pal., Fl. Venezuela, Verbenaceae (1977) 291; Moldenke, Phytologia Mem. II, Sixth Summary Verbenac. etc. (1980) 379, 397, 398, 411; Moldenke in Dassan. & Fosberg, Fl. Ceylon 4 (1983) 277; Raj, Rev. Palaeobot. Palynol. 39 (1983) 367; R.W. Sanders, Sida 10, No. 4 (1984) 308, 309; T.D. Stanley in T.D. Stanley & E.M. Ross, Fl. S. E. Qld 2 (1986) 368; Jans.-Jac., Fl. Guianas (1988) 39; R.W. Sanders in R.A. Howard, Fl. Lesser Antilles, Part 3 (1989) 224; A.C. Smith, Fl. Vitien. 5 (1991) 175; Verdc. in Polhill, Fl. Trop. E. Afr. Verbenaceae (1992) 48; Jarvis et al., Regnum Veg. 127 (1993) 44; Greuter et al., Regnum Veg. 129 (1993) 379.

Lectotype: *D. repens* L., Sp. Pl. 2 (1753) 637. Designated by N.L. Britton, Fl. Bermuda (1918) 316, *sic* Jarvis et al., Regnum Veg. 127 (1993) 44 and Jarvis pers. comm. 10 Nov. 1993 & 6 Jan. 1994.

Castorea Plum. ex Mill., Gard. Dict. edn 4, Vol. 1 (1754) – according to Moldenke (1940, 1983) - *nom. illeg.*

Ellisia P. Browne, Hist. Pl. Jamaic. (1756) 262 – according to Moldenke (1940, 1983).

Type: *E. frutescens* P. Brown, loc. cit. (1756) 262, t. 29, fig. 1.

Shrubs or small trees. *Stem* branched, woody, subquadrangular, glabrous, pubescent, sometimes armed with spines, the branches often elongated and pendent. *Leaves* simple, decussate-opposite or whorled, entire or dentate-serrate, deciduous, chartaceous to subcoriaceous. *Inflorescence* axillary and terminal racemes. *Flowers* pedicellate, bracteate, bisexual, zygomorphic. *Calyx* persistent, gamosepalous, tubular, 5-ribbed, each rib terminating in a tooth, in fruit accrescent, fleshy and indehiscent or coriaceous and somewhat splitting away at maturity. *Corolla* gamopetalous, hypocrateriform, 5-lobed, zygomorphic; tube cylindric, straight or somewhat curved above, exerted from the calyx; lobes regular or oblique, spreading, usually unequal. *Stamens* 4, didynamous, included, inserted above the middle of the corolla-tube; filaments very short; anthers sagittate, dorsifixed, the cells parallel. *Ovary* more or less completely 8-locular, composed of 4 bilocular carpels, each locule with 1 ovule; style terminal, the stigma obliquely subcapitate. *Fruiting-calyx* flask-shaped, usually longer than and often enclosing the fruit. *Fruit* a drupe, the exocarp fleshy, the endocarp hard; pyrenes 4, each bilocular and 2-seeded. *Seeds* without endosperm.

Number of species: World \pm 17 species and several infraspecific taxa; Australia: one naturalised species introduced from tropical America.

Derivation of name

The genus is named after Castor Durante, c.1529–1590, a French physician and botanist who was the Pope's physician, and who wrote on West Indian plants.

Distribution (Map 1)

According to Moldenke (1973, 1983) and others, the genus *Duranta* is "widespread in subtropical and tropical America from Florida and Bermuda through the West Indies, Mexico, and Central America, to Argentina". Several species are widely cultivated for their white to purple flowers and bright orange fruits. Some frequently escape and become more or less naturalised. In Australia, it is represented by only one naturalised species *D. erecta*.

Comments

There has been some controversy about the type of the genus *Duranta*. As mentioned under the "History of the Genus", Linnaeus (1753) described this genus with two species *D. repens* and *D. erecta* but did not choose one as a type. A lectotypification of the genus, therefore, was needed. This seems to have been accomplished by Hitchcock & Green (1947) who specifically designated *D. erecta* as the lectotype for *Duranta*. Jarvis et al.

(1993) seem not to have accepted this typification because they believed that Britton (1918) was the first to choose *D. repens* as a type for the genus. Jarvis informed the present author (pers. comm. 10 Nov. 1993) that "the earliest choice seems to have been that of *D. repens* by Britton, *Flora of Bermuda* (1918), and in our recent list of Linnaean generic Names (*Regnum Vegetabile* 127. 1993), we have followed this choice". Britton (1918) recognised only one species *D. repens*, with *D. erecta* and *D. plumieri* in synonymy. Apparently it seems to be an ambiguous lectotypification because Britton gave no clear indication that he was choosing *D. repens* as the lectotype.

The present author wrote back to Jarvis and explained that there are also earlier but similar publications by Hiern (1877, 1900) in which *D. erecta* was accepted and *D. repens* and *D. plumieri* were in synonymy. If Britton's publication constitutes valid lectotypification then Hiern's earlier ones must be adopted for similar reasons. If, however, it is considered that neither constitutes valid lectotypification then one must follow Hitchcock & Green (1947) who specifically named *D. erecta* as the lectotype. In response to this second query, a facsimile message on behalf of Jarvis from N. Turland (6 Jan. 1994) reiterated Jarvis's earlier opinion that "*Britton's Flora of Bermuda* remains the earliest such designation". He further explained that "Britton may appear somewhat ambiguous in some of his designations, and his treatment of *Duranta* in *Flora of Bermuda* (1918) is an example of this. His genus description ends with the statement 'about 8 species, natives of tropical America, the following typical.' There then immediately follow *D. repens* L. Here Britton's use of the phrase 'the following typical' should, I believe, be interpreted as a designation of generitype, although admittedly it appears ambiguous when taken out of the context of the *Flora* as a whole. Britton explicitly states 'Type species: [name]' when he designates as generitype one of two or more species included in the *Flora*, or a species not in the *Flora* but, where the generitype is the only species included in the *Flora*, as is the case with *Duranta*, he consistently used the phrase 'the following typical'. In Britton & Brown's *An Illustrated Flora of the Northern United State, Canada and the British Possessions* ed. 2 (1913), further generitypes are designated in the same manner. Merely accepting one name and including another in synonymy does not constitute designation of a generitype. Therefore, *Duranta erecta* L. is not so designated in the publication by Hiern". In view of the above explanations by Jarvis and Turland, the present author has accepted *D. repens* as the lectotype of *Duranta*.

Moldenke (1971, 1973, 1983) acknowledged respectively 48, 50, and 53 species and infraspecific taxa in *Duranta*. Sanders (1984) disagrees with Moldenke and several other botanists and believe that *Duranta* has "only 17 species, none of which has well marked geographically coherent subdivisions". Nevertheless, he agreed with Moldenke on the polymorphic nature of its taxa and states that a "considerable variation exists in *Duranta*. However, many of the variants, which include named species, appear to be morphologically intermediate to other more widespread taxa, as well as appear to occupy zones of geographic sympathy of these taxa. This suggests that the variants are hybrids or taxa of hybrid origin. Although there is not yet any direct evidence of hybrids, I have demonstrated natural hybridisation in the related woody genus *Lantana*".

During palynological studies in the Verbenaceae, Raj (1983) examined five *Duranta* species and described their pollen grains as "elliptic in equatorial view (2:3)".

Affinities

Duranta is closely related to *Citharexylum* L. in its inflorescence being axillary and in having terminal racemes; flowers pedicellate and fruit drupaceous. Nevertheless, *Duranta* may easily be distinguished by its ovary being 8-locular; fruiting calyx longer than and often enclosing the fruit and beaked; fruit composed of 4 pyrenes, each 2-locular and 2-seeded. There are a few characters in common with *Rhaphithamnus* Miers. In both genera,

the inflorescence is racemose; flowers pedicellate; fruiting calyx tightly adnate to the fruit and enclosing it; stamens didynamous; fruit globose and fleshy. However, *Rhaphithamnus* can readily be identified by its 2 stamens being slightly exserted; anthers with divergent thecae; fruit blue, composed of 2 pyrenes, each 2-celled and 2-seeded.

Duranta erecta L., Sp. Pl. edn 1, 2 (1753) 637; Hiern in Warm. (ed.), Symbolae Fl. Brasil. Cent. Cogn. part 23 (1877) 711; Hiern, Cat. Afr. Pl. Welw. 4 (1900) 831; Urb., Symb. Antill. 4 (1911) 536 & ibid. 8 (1921) 599; Knuth, Feddes Repert. Sp. Nov. Beih. 43 (1927) 606; Caro, Revista Argent. Agron. 23 (1956) 6, fig. 1; Backer & Bakh.f., Fl. Java 2 (1965) 599; Bromley, Kew Bull. 39, No. 4 (1984) 803; Jans.-Jac., Fl. Guianas (1988) 39, fig. 8; R.W. Sanders in R.A. Howard, Fl. Lesser Antilles, part 3 (1989) 225, fig. 92; Hnatiuk, Cens. Aust. Vasc. Pl. 2 (1990) 626; H. Keng, Conc. Fl. Sing. (1990) 193; A.C. Smith, Fl. Viti. Nov. 5 (1991) 176; Verdc. in Polhill (ed.), Fl. Trop. E. Afr. Verbenaceae (1992) 48, fig. 7.

Lectotype: Plumier's plate with analytical drawings of the flower and fruit, filed under the name *Castorea* (Library, University of Groningen, Netherlands. The precise location in the library is: Manuscript 98a, Department of Old and Rare Books. One syntype (plate) also in the same place. Photographs in AD!).

D. repens L., Sp. Pl. edn 1, 2 (1753) 637; Kuntze, Rev. Gen. Pl. 2 (1891) 507; Britton, Fl. Bermuda (1918) 317, fig. 339; Merr., Enum. Philip. Pl. 3 (1923) 381; Standl., Contr. U. S. Nat. Herb. 23, part 4 (1924) 1241; Britton & P. Wilson, Sci. Surv. Porto Rico Virgin Isl. 6 (1925) 146; Moldenke, Lilloa 4 (1939) 314; Publ. Carnegie Inst. Wash. No. 522 (1940) 196; L.J. Webb, Bull. Council Sci. Indust. Res. No. 232 (1948) 168; Sastri, Wealth India 23 (1952) 117; Moldenke, Fl. Madag. (1956) 40, fig. V-1-4; Résumé Verbenac. etc. (1959) 188, 190, 195, 196, 203, 204, 206, 208, 218, 250, 282–285, 426, 455; J.F. Macbr., Fl. Peru, Field Mus. Nat. Hist. Bot. Ser., Vol. 13, part 4 (1960) 685; Santapau, Rec. Bot. Surv. Ind. 16, edn 2 (1960) 191; Gooding et al., Fl. Barbados (1965) 358, fig. 23; D.N. Gibson in Standl. & L.O. Williams (eds), Fl. Guatemala, Fieldiana: Bot. 24, part 9 (1970) 199, fig. 38; Moldenke, Fifth Summary Verbenac. etc. 1 & 2 (1971) 336, 343, 344, 346, 350, 362, 424, 474, 477, 487–491, 776, 782, 877; C.D. Adams, Fl. Pl. Jamaica (1972) 632; Moldenke, Ann. Missouri Bot. Gard. 60 (1973) 90; Jafri & Ghafoor, Fl. W. Pak. No. 77 Verbenaceae (1974) 18; Lopez-Pal., Revista Fac. Farm. Uni. Los Andes Mérida, No. 15 (1974) 26; Lopez-Pal., Fl. Venezuela, Verbenaceae (1977) 299, fig. 70; Moldenke, Phytologia Mem. II, Sixth Summary Verbenac. etc. (1980) 314, 326, 329, 331, 333, 336, 340, 341, 353, 379–400, 546–547; Lord & J.H. Willis, Shrubs & Trees Aust. Gard. edn 5 (1982) 225; Moldenke in Dassan. & Fosberg (eds), Fl. Ceylon 4 (1983) 278; Bromley, Kew Bull. 39, No. 4 (1984) 803; R.W. Sanders, Sida 10, No. 4 (1984) 311; T.D. Stanley in T.D. Stanley & E.M. Ross, Fl. S. E. Qld 2 (1986) 369, fig. 51J; O.W. Borrell, Fl. Kairiru Isl. New Guinea (1989) 145.

Neotype: Patrick Browne s.n., Jamaica, undated, Herb. Linn. No. 806.2 (LINN). Designated by R.W. Sanders, Regnum Veg. 127 (1993) 44.

The following synonymy was taken from recent literature and was not researched in detail:

Castorea racemosa Plum. ex Mill., Gard. Dict. edn 4, 1 (1754) – according to Schauer (1847) – *nom. illeg.* Based on Plumier, Nov. Pl. Amer. Gen. (1703) 30, t.17.

Ellisia frutescens P. Browne, Civ. Nat. Hist. Pl. Jamaica (1756) 262, t.29, fig. 1 – according to Moldenke (1959, 1971, 1983).

Type: P. Browne s.n. Jamaica, (LINN, n.v., probably Herb. Linn. No. 806.1, microfiche!). According to Stafleu & Cowan (1976), "Browne sold his Jamaican herbarium to Linnaeus in 1758 through Collinson. It is now at LINN. - 103 original drawings of Jamaican plants by Ehret are [also] at BM"

Ellisia acuta L., Amoen. Acad. 5 (1760) 400 – according to Moldenke (1939, 1959, 1971).

Type: Pugill s.n., Jamaica (n.v.).

Duranta ellisia Jacq., Enum. Syst. Pl. (1760) 26; Select. Stirp. Amer. Hist. (1763) 187, t.176, fig. 77 – according to Moldenke (1983) & R.W. Sanders (1984), *nom. illeg.* Based on *Ellisia frutescens* P. Browne (1756) 262, t.29, fig. 1. Type according to Stafleu & Cowan (1979) H-Le, "Jacquin's material from the West Indies in the Banks herbarium (now BM) is rare and consists of scraps or small specimens"

D. plumieri Jacq., Enum. Syst. Pl. (1760) 26; Select. Stirp. Amer. Hist. (1763) 186, t.176, fig. 76; F.M. Bailey, Econ. Pl. Qld (1888) 31; Weeds & Susp. Poison. Pl. Qld (1906) 142; F.M. Bailey, Compr. Cat. Qld Pl. (1913)

382. – according to Lopez-Pal. (1977), Moldenke (1983) & R.W. Sanders (1984, 1989) – *nom. illeg.* Based in part on a Plumier's plate 17 (1703) and Linnaeus's *D. repens* and *D. erecta* (1753).

D. racemosa Mill., Gard. Dict. edn 8 (1768), sphalm. "*Durantia racemosa*". – according to Moldenke (1983) & R.W. Sanders (1984).

Type: *Houston s.n.*, Jamaica (n.v., 'photo NY!') – according to R.W. Sanders, 1984).

D. latifolia Salisb., Prod. Stirp. Hort. Allerton (1796) 108, *nom. nud.* – according to Moldenke (1983) & R.W. Sanders (1984).

D. dentata Rich. ex Pers., Synop. Pl. 2 (1806) 142 – according to Moldenke (1983) & R.W. Sanders (1984).
Type: "Hab. in Africa ? (herb. Richard)" (L or P, n.v.).

D. macrocarpa Kunth in Humb., Bonpl. & Kunth, Nov. Gen. & Sp. Pl. 2 (1818) 255; Schauer in A. DC., Prod. Syst. Nat. Veg. 11 (1847) 616 – according to Standley (1924).
Type: *Humboldt & Bonpland s.n.*, "crescit in Nova Hispania?" (P-Bonpl., microfiche!).

D. xalapensis Kunth in Humb., Bonpl. & Kunth, Nov. Gen. & Sp. Pl. 2 (1818) 255 – according to Moldenke (1983) & R.W. Sanders (1984).
Type: *Humboldt & Bonpland s.n.*, loc. incert. Mexico, undated (P-Bonpl., microfiche!).

D. microphylla Desf., Cat. Hort. Paris edn 3 (1829) 392, *nom. nud.* – according to Lopez-Pal. (1977).

D. plumieri Jacq. var. *strigillosa* Schauer in Mart., Fl. Braz. 9 (1851) 271, p.p. – according to Moldenke (1983) & R.W. Sanders (1984), *nom. illegit.* Based on *D. plumieri* Jacq. and *D. ellisia* Jacq.

D. integrifolia Todaro, Nuovi Gen. Nuovi Sp. Palmero (1858) 27 – according to R.W. Sanders (1984).

D. turbinata Todaro, Nuovi Gen. Nuovi Sp. Palmero (1858) 28 – according to R.W. Sanders (1984).

D. bonardi Guillard ex Bocq., Adansonia 2 (1862) 112 – according to Moldenke (1983).

D. parviflora Turcz., Bull. Soc. Nat. Moscow 36 (1863) 210 – according to R.W. Sanders (1984).

D. plumieri Jacq. var. *alba* Mast. in Gard. Chron. III, 3 (1888) 44, fig. 9 – according to A.C. Smith (1991).

D. plumieri Jacq. var. *ellisia* (L.) Hort. ex Woodrow, Garden. Ind. (1889) 420 – according to Moldenke (1973, 1983).
Type: As for *Ellisia acuta* L.

D. plumieri Jacq. var. *glabra* Hiern ex Niederl., Bol. Mens. Mus. Prod. Argent. 3 (31) (1890) 322 – according to Moldenke (1973, 1983).

D. repens L. var. *alba* (Mast.) L.H. Bailey in L.H. & E.Z. Bailey, Hortus (1930) 225 – according to A.C. Smith (1991).
Type: As for *D. plumieri* var. *alba* Mast.

D. rostrata Hort. ex Wehmer, Pflanzenst. edn 2, 2 (1931) 1023 – according to Moldenke (1973, 1983).

D. repens L. var. *canescens* Moldenke, Phytologia 1 (1940) 436 – according to R.W. Sanders (1984).
Type: Killip & Smith (No. 14990), at an altitude of 1000–1500 m on the northern slope of the mesa de los Santos, Santander Sur, Colombia, 11–15.xii.1926 (F, n.v.).

D. peruviana Moldenke var. *longipedicellata* Moldenke, Bull. Torrey Bot. Club 68 (1941) 502 – according to R.W. Sanders (1984).
Type: F.L. Herrera 3209, valley of the Urubamba, Machupicchu, alt. 2200m, Cuzco, Peru, -x.1931 (F, holotype, n.v.; photo of holotype in NY – seen by R.W. Sanders, 1984).

D. repens L. var. *microphylla* (Desf.) Moldenke, Phytologia 1 (1941) 483.
Type: As for *D. microphylla* Desf.

D. erecta L. var. *alba* (Mast.) Caro, Revista Argent. Agron. 23 (1956) 11 – according to A.C. Smith (1991).
Type: As for *D. plumieri* Jacq. var. *alba* Mast. (1888).

D. repens L. var. *serrata* Moldenke, Phytologia 7 (1959) 81 – according to R.W. Sanders (1984).
Type: Venturi 9059, loc. incert. (NY, holotype, n.v. – seen by R.W. Sanders, 1984).

D. macrophylla Bose, Handbook Shrubs (1965) 46, 107, 122, 123 – according to Moldenke (1973, 1983).

D. repens L. var. *lopez-palacii* Moldenke, Phytologia 26 (1973) 177 – according to R.W. Sanders (1984).

Type: Ruiz-Teran & M. Lopez-Figueiras 1923, in the vicinity of San Antonio, about 5 km below El Portachuela (El Ramal) in the Cordillera de Los Andes, at an altitude of 1820 m, in the district of Sucre, Mérida, Venezuela, 28.v.1971 (NY, holotype, n.v. –seen by R.W. Sanders, 1984).

Typification of *D. erecta* & *D. repens*.

Linnaeus (1753) based *Duranta* and its two [syntype] species on Plumier's description (with accompanying illustration) (1703) namely "Castorea repens, spinosa" and "Castorea racemosa, flore caeruleo, fructu croceo". These species were renamed by Linnaeus (1753) *D. repens* and *D. erecta*. Plumier's illustration was subsequently published by J. Burman (1756) with a drawing of a twig not in Plumier's publication as t. 79 and cited by Linnaeus (1759). Nevertheless, Linnaeus did not designate any type for *D. repens* or *D. erecta*. The selection of types for these taxa is therefore necessary. A discrepancy in the typification of these taxa occurs in the literature. For instance Caro (1956) selected Burman's (1756) plate 79 as the lectotype of *D. erecta*. This was accepted by Bromley (1984), Jansen-Jacobs (1988), Sanders (1989) and Verdcourt (1992). However, the publication of this plate by J. Burman (1756) postdates the Linnaean protologue (1753), and can therefore not be taken as the lectotype. To typify the name it is necessary to determine the element used by Linnaeus in preparing the protologue of *D. erecta*. According to Gillis & Stearn (1974), Plumier's original illustrations (total c. 6000), now preserved in Bibliothèque Centrale, Museum National d'Histoire Naturelle, Paris, were not available to Linnaeus when preparing the 'Species Plantarum' (1753). A set of 508 copies of these drawings was made by Claude Aubriet in Paris in 1733 for Herman Boerhaave in Leiden, and came to be known as the "Codex Boerhaavianus" (Stafleu & Cowan 1983, Polhill & Stearn 1976). This set was seen and used by Linnaeus during his stay in Holland in 1738. According to Polhill & Stearn (1976), "About 50 species seemed to be based solely or principally on Plumier's drawings not available to him when preparing the 1753 *Species Plantarum*". After Boerhaave's death in 1739, these drawings were acquired by J. Burman, who began to publish copies of them in 1756 as *Plantarum Americanarum Fasciculus*. The descriptions published with the copies of the drawings were by J. Burman. The set of drawings is now preserved in the Department of Old and Rare Books in the Library of the Rijksuniversiteit Groningen, Netherlands. Plate 79 of Burman's work, named by him *Duranta inermis* L., agrees in every detail with the copy of the original drawing used by Linnaeus in preparing the protologue of *D. erecta* (1753).

There are two drawings in the Library of Groningen University, each with almost identical habit sketch of a branch with flowers and fruits. Both were possibly seen by Linnaeus while preparing the protologue. One of them, however, has been supplemented with analytical drawings of the flower and fruit. Since the original drawings used by Linnaeus are extant, the type should be chosen from that material. The more detailed plate (with analytical drawing) is chosen here as the lectotype of *D. erecta*.

The type of *D. repens* remained undecided for a considerable period. Moldenke (1983) and Sanders (1984) suggested Linn. Herb. 806.1 as a "Possible Type" of *D. repens* and this was accepted by A.C. Smith (1991). In the same publication Sanders (1984) proposed Linn. Herb. 806.2 as a "Possible Type" of *D. erecta* and in 1989 he [Sanders] recorded the same number [806.2] as a "Type" of *D. repens*. A few years later, Verdcourt (1992) cited Plumier's t.17 as a type of *D. repens*. The confusion about the type of *D. repens* persisted because there are no original elements for *D. repens*, apart from Plumier's t.17 which is a generic illustration covering both *D. erecta* and *D. repens* and can therefore not be used to interpret only one of them. Since the material on which Plumier's t.17 was based does not seem to be extant, I follow R.W. Sanders (1993) who designated Linn. Herb. 806.2 (LINN) as a neotype of *D. repens*.



Fig. 1. *Duranta erecta* L. (A - K, G.R.M. Dashorst & A.A. Munir 6250 : AD). A, habit sketch of a branch with flowers and fruit; B, stem with axillary spines; C, portion of stem showing 4-angles and speckles on bark; D, flower (arrows indicate papillose areas in D, G); E, top view of corolla-tube and corolla-lobes; F, 5-angled calyx-tube with minute teeth at the rim; G, longitudinally cut open corolla showing androecium and gynoecium; H, stamens with hairy filaments; I, gynoecium; J, transverse section of ovary; K, fruit.

Description (Fig. 1 & 2)

Shrub up to 7 m tall. *Branches* subquadrangular, drooping or trailing, unarmed or spiny, sparsely appressed-pubescent, becoming glabrous with age. *Leaves* short-petiolate; lamina ovate, elliptic or obovate, membranous-chartaceous, (15-) 20–75 (-90) mm long, (12-) 15–50 (-60) mm wide, obtuse, acute or shortly acuminate at apex, entire or coarsely serrate above the middle, cuneate-attenuate at base into the short petiole, sparsely appressed-pubescent on both sides, soon becoming subglabrous, primary and secondary veins slightly prominent, secondary veins 4–6 pairs; petiole (1-) 3–10 (-15) mm long, appressed-pubescent. *Inflorescence* terminal and axillary, 10–30 cm long; racemes many-flowered, erect or usually recurved or pendent, 3–10 (-15) cm long, appressed-pubescent; peduncle 5–15 mm long. *Flowers* fragrant; bracts minute, linear, 1–4 mm long or the lower ones occasionally subfoliaceous and exceeding the calyx; pedicel 1–5 mm long; usually appressed-pubescent. *Calyx* tubular, accrescent, 3–7 mm long, glabrescent, appressed-pubescent or canescent outside, glabrous inside; tube 5-angled, with 5 minute teeth at the rim; teeth triangular at base, subulate at apex, 0.5–1 mm long. *Corolla* mauve, light bluish-purple or white, hypocrateriform, puberulous outside, pubescent inside, often glandular specially in the throat, the puberulence often canescent in bud; tube 6–10 mm long, 1.5–2 mm diam., surpassing the calyx by 2–3 mm; lobes oblong, elliptic-oblong or almost orbicular, obtuse, usually puberulent within and outside, 3–5 mm long, 2.5–3.5 mm wide. *Stamens* inserted above the middle of the corolla-tube; filaments 0.5–1.5 mm long, with a few hairs; anthers oblong, \pm 1 mm long. *Ovary* subglobose, \pm 1 mm diam., glabrous; style included, filiform, glabrous, 2–3 mm long; stigma minutely capitate, 4-lobed. *Fruit* orange-yellow, subglobose or obpyriform, glabrous, (5-) 7–10 (-14) mm diam., completely enclosed by the accrescent orange-yellow shiny calyx which is prolonged into 1–2 mm long curved beak.

Specimens examined (collections seen: Australian 25, non-Australian 15)

AUSTRALIA: QUEENSLAND: *Blake* 2325, Petrie, ca 29 km N of Brisbane, .iii.1931 (BRI); *Croat* 52691, Gold Creek, 1.6 km W of Brookfield, ca 16 km W of Brisbane, 28.viii.1981 (QRS); *Dietrich* 739, Brisbane River, 1863–1865 (AD); *Dillewaard & Stanley* 607, Brisbane, on river bank, 20.v.1981 (BRI, CANB); *Dillewaard & Stanley* 729, Stradbroke Island, Dunwich, 27.vii.1981 (BRI); *Hawkeswood* A56, Millaa Millaa, Atherton Tableland, 5.x.1980 (BRI); *Hubbard* 2744, Mt Gravatt, near Brisbane, 24.v.1930 (BRI, K); *Forster* 6611, Black Gin Creek, Timber Reserve 580, Wide Bay District, 1.iv.1990 (BRI, MEL); *Francis* s.n., Myers Ferry, Southport, -iv.1920 (BRI); *Lyons* 47, Queerah, corner of Robert Road and Bruce Highway, Cairns, 17.vii.1987 (BRI); *Rogers* s.n., near Bowen, 2.vii.1957 (BRI); *Scarth-Johnson* 1175A, Cooktown, near bottom of Grassy Hill, -xi.1980 (BRI); *Shield* s.n., Gin Gin, 11.vii.1963 (BRI); *Stanley* 558, base of Mt Archer, near Rockhampton, 18.ii.1980 (BRI); *Stanley* 1011, between Bundaberg and Bargara, 17.iii.1980 (BRI); *Staples* 140572/6, 6A, 6B, 3.2 km W of Kuranda, Kennedy Highway, 14.v.1972 (BRI 3 spec., CANB); *Thompson* 37, Landing Creek near Cape Hillsborough, -v.1985 (BRI); *Volck* 04740, Cooktown, -iii.1971 (BRI); *White* s.n. Enoggera Creek, 1920 (BRI); *White* 11861, Wellington Point, Moreton Bay, 15.xi.1942 (BRI 2 spec.); *White* s.n., Hercules Bank, Brisbane River, undated (BRI 268211).

NEW SOUTH WALES: *Hicks* s.n., Tenterfield, -iii.1913 (NSW 231655); *Lawrence* s.n. & *McBarron* 21458, Woodville, 1.iv.1976 (NSW 231598); *McBarren* L7, corner Cordeaux and Oxley streets, Campbelltown, 21.xi.1969 (NSW); *Salasoo* 2571, 3.2 km W of Kyogle, 1.i.1963 (NSW 231658).

SOUTH AUSTRALIA: *Bates* 13968, near old ruins of One Tree Hill, Para Wirra Road, 29.xi.1988 (AD).

NORTHERN TERRITORY: *Allen* T21, Darwin, -xi.1919 (NSW 231663).

PAPUA NEW GUINEA: *Hoogland* 6573, Markham Valley, ca 9.6 km inland from Lae, 5.xi.1959 (CANB).

PHILIPPINES: *Frake* 351, Pasanan, Zamboang del Norte, Mindanao, 21.xi.1957 (CANB).

EAST INDIES: Herb. *Schomburgk* s.n., loc. incert. undated (AD 97942899).

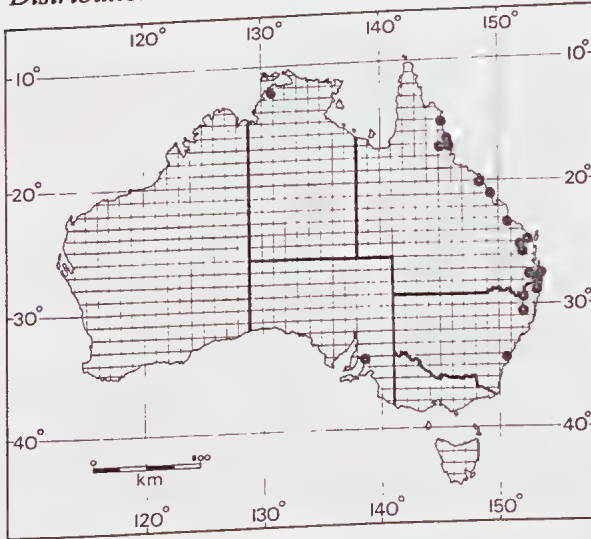
INDIA: *Bhattacharya* 03, Sonarpur, -v.1981 (AD, CAL).

CHINA: *Chow & Wan* 187, Xishuanbanna, Yunnan, -1980 (AD, IBSC n.v.); *Shi* 14706, Dinghushan, Guangdong, 29.v.1984 (AD, IBSC n.v.); *Yip* 227, Guangzhou, Guangdong, 17.iv.1981 (AD, IBSC n.v.).

A.A. Munir

ARGENTINA: *Leguizamón* 5754, Gandelaria, San Juan, Misiones Prov., -xi.1949 (AD, BAB, n.v.); *Montes* 722, Lib. Gral. San Martín, Puerto Rico, Misiones Prov., 5.v.1948 (AD, BAB, n.v.).

Distribution and ecology (Map 1)



Map. 1. Distribution of *D. erecta* in Australia

near Para Wirra Recreation Park.

According to Moldenke (1983), this taxon occurs "almost throughout subtropical and tropical America from the southernmost United States to Argentina; introduced and often naturalised in many parts of tropical Africa, Asia, Australia, and Oceania".

According to Australian collectors' field notes, it grows on river banks in gravelly sandy soil, foreshore slopes in open forest, on sandy, alluvial or granite soils. also recorded along roadsides and with scrubby vegetation in grazing paddock. Moldenke (1983) recorded it as a common plant of woods, thickets, hedgerows, fencerows, and roadsides. Gibson (1970) recorded this species from thickets, secondary forest, hedges, along roadsides and at an altitude of 500–2600 meters.

Comments

In Australia and elsewhere, this species has been recorded under the name *D. plumieri*, *D. repens* or *D. erecta*. The confusion on the correct name of this species started when Burman (1756) apparently in error picked up Linnaeus's adjectival name "inermis" for *D. erecta* and published Plumier's plate 79 under that name. Subsequently, Jacquin (1760, 1763) repeated the same error by picking up Linnaeus's adjectival names "inermis" for *D. erecta* and "spinosa" for *D. repens*, and placed these into synonymy of his own species *D. plumieri*. In the second edition of "Species Plantarum", Linnaeus (1763) published *D. plumieri* Jacq. and cited his own adjectival names "D. spinosa" and "D.inermis" in synonymy. Since then, the confusion on the proper name of this taxon has been perpetuated, with most early botanists using *D. plumieri* Jacq. and later botanists using *D. repens* L. or *D. erecta* L. Recently, Caro (1956) and Bromley (1984) discussed the problem at length and concluded that *D. erecta* was the proper name for this taxon. Many botanists, however, are still using the name *D. repens* which is now a synonym of *D. erecta*. According to Bromley (1984), "Hiern (1877) should be followed as he was the first botanist

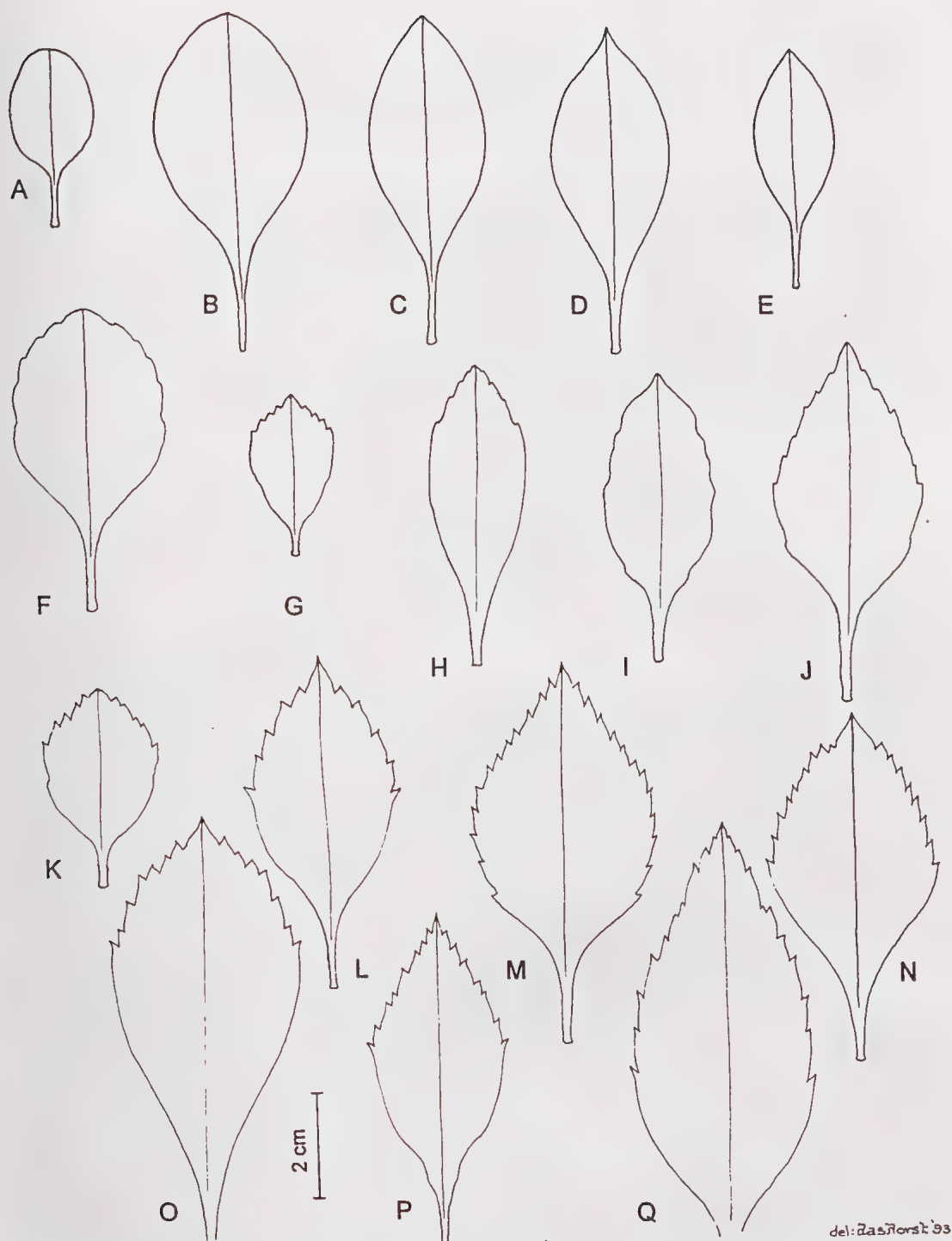


Fig. 2. Range of variation in shape of leaves of *Duranta erecta* L. A, C.T. White 11861: BRI; B, I.B. Staples 140572/6: BRI; C, I.B. Staples 140572/6B: BRI; D, L. Rogers s.n.: BRI 005734; E, C.T. White 1186: BRI; F, P. Thompson 37: BRI; G, P.I. Foster 6611: BRI; H, A. Dietrich 739: AD; I, C.E. Hubbard 2744: BRI; J, I.B. Staples 140572/6: CANB; K, I.B. Staples 140572/6A: BRI; L, T. Stanley 1011: BRI; M, H. Salasoo 2571: NSW; N, H. Dillewaard & T. Stanley 607: BRI; O, E. Volck 0474: BRI; P, H. Dillewaard & T. Stanley 607: CANB; Q, C. Lyons 47: BRI.

A.A. Munir

who cited *D. erecta* with *D. repens* in synonymy". On the contrary, Sanders (1984), who apparently did not see Hiern's (1877) publication, states that "Kuntze (1891) was the first author to combine *D. repens* and *D. erecta* and, in so doing, gave priority to *D. repens*". At that stage, Sanders (1984) was probably unaware of Caro (1956) who used the name *D. erecta* and selected Burman's (1756) t. 79 as the lectotype of this species. (See typification of *D. erecta*).

This species is frequently planted for ornamental purposes in tropical and subtropical regions of both hemispheres. It has often been established as an escape. In Australia, it is widely cultivated as a hedge or ornamental plant, and according to Bailey (1913) "This common and excellent hedge-plant has run out into the pasture very little, but should the fruit at any time become the food of some animal the plant will become a great pest, as it bears fruit abundantly". Bailey's apprehension was justified because it has become naturalised in several parts of Australia. Recently, Stanley (1986) recorded it "naturalised in the Moreton and Wide Bay districts" in Queensland. During present research, it has been found naturalised in a few other pastoral districts in Queensland as well as in parts of neighbouring States.

Bailey (1906, 1913) recorded under *D. plumieri* three varieties namely var. *alba*, var. *ellisia*, and var. *normalis* i.e. the normal or the typical variety. All these varieties are distinguished from each other chiefly by the colour of their flowers. Under var. *ellisia*, Bailey (1913) also recorded forma *variegata* in which the leaves are marked with irregular patches of different colours. All these infraspecific taxa are possibly grown in Australian gardens and nurseries, but only the typical variety is definitely known to be naturalised in Australia. The present author has been unable to distinguish these varieties in the specimens examined because the corolla-colour often completely fades in dry state. Recently published regional floras have not recorded any naturalised variety under this species.

Webb (1948) stated that this species was "cultivated and spontaneous. Fruits said to have caused illness and death of children in Queensland, with symptom of sleepiness, high temperature, rapid pulse and convulsions. The plant has also been suspected of poisoning live stock, and is said to contain a saponin". Chopra, Badhwar & Nayar (1941) claim that "Juice of fruits [is] toxic to mosquitoes in dilutions up to 1:100. Leaves contain saponin, and fruits said to contain alkaloid analogous to narcotine". Merck (1940) asserted that "bark of *D. ellisia* [now syn. of *D. erecta*] yields glucoside duratin". According to Standley (1924), "The fruit has been used as a febrifuge, and stimulant properties have been ascribed to the flowers".

In view of the presence and absence of prickles, generally on different parts of the same plant, it has been commonly named "prickly duranta" or "smooth duranta". There are several other common names attributed to this species of which a few popular ones are "golden-dewdrop", "pigeon-berry", "heliotrope-bush", "skyflower", "angel's whisper" and "poison macca".

Britton (1918) recorded unusually long pedicels ranging " $\frac{1}{2}$ – $2\frac{1}{2}$ " long" [i.e. 12.2–63 mm]. Such a long pedicel has not been observed during present investigation.

According to Moldenke (1939, 1940, 1971, 1973, 1983), this species is "an extremely variable and polymorphic shrub or a small tree". In Sanders's view (1984), it "is very variable, especially with respect to habit, to the overall shape, margins and apex of the leaf, and to the presence and size of thorns". During present investigation, a significant range of variation in shape of leaves has been observed in Australian material of *D. erecta* (see Fig. 2).

Affinities

D. erecta is nearest to *D. mutisii* L.f. in its mature leaf-blades being glabrous or subglabrate beneath and inflorescence branches bracteate or with 1 or 2 much reduced leaves below the flowering portion. Nevertheless, *D. erecta* may easily be distinguished by its leaf-venation being not impressed adaxially. There are several characters in common between *D. erecta*, *D. peruviana* Moldenke and *D. stenostachya* Torado. According to Sanders (1984), however, "*D. peruviana* and *D. stenostachya* may be conspecific with *D. repens* [= *D. erecta*], each forming a geographic race".

Var. *alba* differs from the typical variety by its white corolla and var. *microphylla* by its mature leaf-blades being mostly or uniformly less than 15 mm in length.

Acknowledgements

The author is grateful to Dr J.P. Jessop for comments on the draft of this manuscript; to Ms K.A. Saxby, Librarian, Adelaide Botanic Gardens, for help in procuring the relevant literature; to Ms N.C.T. Wieland, Staff member Department of Old and Rare Books, Bibliotheek der Rijksuniversiteit Groningen, Netherlands, for providing the photograph of *Duranta* drawings; to Mr G.R.M. Dashorst for preparing the illustrations.

Thanks are also due to the Directors/Curators of the following herbaria for the loan of herbarium specimens: BRI, CANB, MEL, NSW, QRS.

References

- Adanson, M. (1763). "Familles des plates", Vol. 2: 195–201. (Vincent: Paris).
- Bailey, F.M. (1888). "A Sketch of the Economic Plants of Queensland", p.p. 31–32. (Govt Printer: Brisbane).
- Bailey, F.M. (1906). Verbenaceae. "The Weeds and Suspected Poisonous Plants of Queensland", p.p. 140–142. (H. Pole & Co.: Brisbane).
- Bailey, F.M. (1913). Verbenaceae. "Comprehensive Catalogue of Queensland Plants", p.p. 381–387. (Govt Printer: Brisbane).
- Bartling, F.G. (1830). "Ordines naturalis Plantarum". (Dietrich: Göttingen).
- Batsch, A.J.G.K. (1802). "Tabula affinitatum Regni vegetabilis". (Landes-Industrie Comptoir: Weimar).
- Bentham, G. (1839). Enumeration of Plants collected by Mr Schomburgk, British Guiana. *Ann. Nat. Hist.* 2: 445–451.
- Bentham, G. (1870). Verbenaceae. "Flora Australiensis", Vol. 5: 31–70. (L. Reeve & Co.: London).
- Bentham, G. (1876). Verbenaceae. In Bentham, G. & Hooker, J.D. "Genera Plantarum", Vol. 2: 1131–1160. (L. Reeve & Co.: London).
- Bir, S.S. & Sidhu, M. (1979). Cytological observations in weed flora of orchids of Patiala district, Punjab. *Recent Res. Pl. Sci.* (New Delhi) 7: 261–271.
- Bocquillon, H.H. (1863). Revue du groupe des Verbénacées. *Adansonia* 3: 177–186.
- Briquet, J. (1895). Verbenaceae. In Engler, A. & Prantl, K. "Die natürlichen Pflanzenfamilien", part 4, 3a, p.p. 132–182. (Wilhelm Engelmann: Leipzig).
- Britton, N.L. (1918). Verbenaceae. "Flora of Bermuda", p.p. 309–320. (Hafner Publishing Co.: New York).
- Britton, N.L. & Wilson, P. (1925). Botany of Porto Rico and the Virgin Islands. Descriptive flora. Spermatophyta. *Sci. Surv. Porto Rico & Virgin Isl.* 6(1): 137–152.
- Bromley, L.R. (1984). *Duranta repens* versus *D. erecta* (Verbenaceae). *Kew Bull.* 39(4): 803–804.
- Brongniart, A.T. (1843). "Énumération des Genres de Plantes cultivés au Muséum d'histoire naturelle de Paris". (Fortin Masson & Co.: Paris).
- Burman, J. (1756). "Plantarum Americanum Fasciculus Primus, quas olim Carolus Plumierus", p. 70, t.79. (S. Schouten: Amsterdam).
- Caro, J.A. (1956). Las especies de *Duranta* ("Verbenaceae") silvestres y cultivadas en la república Argentina. *Revista Argent. Agron.* 23(1): 1–28.
- Chapman, A.D. (1991). "Australian Plant Name Index D–J", p. 1081. (Aust. Govt Publish. Service: Canberra).
- Chopra, R.N., Bidhwar, R.L. & Nayar, S.L. (1941). Insecticidal and piscicidal plants of India. *J. Bombay Nat. Hist. Soc.* 42: 854–902.
- Coleman, J.R. (1982). Chromosome numbers of Angiosperms collected in the State of São Paulo. *Revista Brasil Genet.* 5: 533–549.
- Dalla Torre, C.G. & Harms, H. (1904). Verbenaceae. "Genera Siphonogamarum ad Systema Englerianum Conscripta", p.p. 429–434. (Wilhelm Engelmann: Leipzig).

A.A. Munir

- Darlington, C.D. & Wylie, A.P. (1955). "Chromosome Atlas of Flowering Plants". (George Allan & Unwin Ltd.: London).
- Dietrich, D.N.F. (1842). *Didynamia Angiospermia*. "Synopsis Plantarum", Vol. 3: 618. (B.F. Voigt: Weimar).
- Domin, K. (1928). Beiträge zur Flora und Pflanzengeographie Australiens. *Biblioth. Bot.* 89: 1105–1116.
- Dumortier, B.C.J. (1829). Verbenaceae. "Analyse des Familles des Plantes", p. 22. (J. Casterman: Tournay).
- Durand, Th. (1888). Verbenaceae. "Index Generum Phanerogamorum", p.p. 319–322. (Dulau & Co.: London).
- Endlicher, S.L. (1838). Verbenaceae. "Genera Plantarum Secundum Ordines Naturales Disposita", Vol. 1: 632–639. (Fr. Beck: Vienna).
- Endlicher, S.L. (1841). Verbenaceae. "Enchiridion Botanicum", p.p. 311–314. (Wilhelm Engelmann: Leipzig).
- Fedorov, A. (1974). "Chromosome Numbers of Flowering Plants". Reprint edn. (Otto Koeltz: Koenigstein).
- Fletcher, H.R. (1938). The Siamese Verbenaceae. *Kew Bull.* 10: 401–445.
- Gaertner, J. (1788). *Centuria Quarta*. "De Fructibus et Seminibus Plantarum", Vol. 1: 266–275. (G.H. Schramm: Tübingen).
- Gibson, D.N. (1970). Verbenaceae. In Standley, P.C. & Williams, L.O. "Flora of Guatemala". *Fieldiana (Bot.)* 24, 9(1 & 2): 167–236.
- Gill, B.S., Bedi, Y.S. & Bir, S.S. (1983). Cytological studies in woody members of family Verbenaceae from north-west and central India. *J. Ind. Bot. Soc.* 62: 235–244.
- Gillis, W.T. & Stearn, W.T. (1974). Typification of the names of the species of *Leucaena* and *Lysiloma* in the Bahamas. *Taxon* 23(1): 185–191.
- Giseke, P.D. (1792). "Caroli à Linné ... Praelectiones in Ordines Naturales Plantarum". (B.G. Hoffmann: Hamburg).
- Gleditch, J.G. (1764). "Systema Plantarum a Stamina situ etc." (Haude & Spencer: Berlin).
- Gmelin, J.F. (1792). "Caroli à Linné ... Systema Naturae" etc. (B.E. Beer: Leipzig).
- Grisebach, A.H.R. (1862). Verbenaceae. "Flora of the British West Indian Islands", p.p. 492–502. (L. Reeve & Co.: London).
- Harvey, W.H. (1868). Verbenaceae. "The Genera of South African Plants", edn 2, p.p. 287–295. (J.C. Juta: Cape Town).
- Hiern, W.P. (1877). Verbenaceae. In Warming, J.E.B. (ed.), "Symbolae ad Floram Brasiliae centralis cognoscendam", p.p. 23: 643–714. (Bianco Luno: Copenhagen).
- Hiern, W.P. (1900). Verbenaceae. "Catalogue of the African Plants collected by Dr Friedrich Welwitsch in 1853–61". Dicotyledons, part IV: 827–847. (Longman & Co.: London).
- Hitchcock, A.S. & Green, M.L. (1947). Supplement species lectotypicae generum Linnaei. *Brittonia* 6(1): 114–118.
- Hnatiuk, R.J. (1990). "Census of Australian Vascular Plants". (Aust. Govt Publish. Service: Canberra).
- Hsu, C.C. (1967). Preliminary chromosome studies on the vascular plants of Taiwan (I). *Taiwania* 13: 117–130.
- Jacquin, N.J. (1760). "Enumeratio Systemica Plantarum", p. 26 (Th. Haak: Leiden).
- Jacquin, N.J. (1763). "Selectarum stirpium Americanum historia", p.p. 186–187. (Kraus.: Vienna).
- Jansen-Jacobs, M.J. (1988). Verbenaceae. In Görs-van Rijn, A.R.A., "Flora of the Guianas". Series A: Phanerogams 4: 3–74. (Koeltz Scientific Books: Koenigstein).
- Jarvis, C.E. et al. (1993). A list of Linnaean generic names and their types. *Regnum Veg.* 127: 44.
- Jaume Saint-Hilaire, J.H. (1805). Verbenaceae. "Exposition des Familles naturelles et de la Germination des Plantes", Vol. 1: 245–253. (Truettel et Würtz: Paris).
- Junell, S. (1934). Zur Gynäceummorphologie und Systematik der Verbenaceen und Labiaten. *Symb. Bot. Ups.* 4: 1–219.
- Jussieu, A.L. de (1789). Vitices. "Genera Plantarum secundum Ordines naturalis disposita", p.p. 106–110. (Viduum Herissant & T.Barrois: Paris).
- Jussieu, A.L. de (1806). Sur la famille des plantes Verbenaceae. *Ann. Mus. Hist. Nat. Paris* 7: 63–77.
- Ker, J.B. (1817). *Duranta*. *Edward's Bot. Reg.* 3: t.244.
- Koul, A.K., Wakhlu, A.K. & Warihaloo, J.L. (1976a). Chromosome numbers of some flowering plants of Jumu (Western Himalaya) II. *Chrom. Inf. Serv.* 20: 30–33.
- Kunth, C.S. In Huboldt, F.W.H.A., Bonpland, A.J.A. & Kunth, C.S. (1818). Verbenaceae. "Nova Genera et Species Plantarum", Vol. 2: 244–285. (a la Librairie grecque-latine-allemande: Paris).
- Lam, H.J. (1919). "The Verbenaceae of the Malayan Archipelago". (M. de Waal: Groningen).
- Lemée, A. (1943). Verbenaceae. "Dictionnaire descriptif et Synonymique des Generes de Plantes Phanerogames", Vol. 8b: 650–657. (Imprimerie Commerciale et Administrative: Brest).
- Lindley, J. (1847). "The Vegetable Kingdom" edn 2. (Bradbury & Evans: London).
- Link, J.H.F. (1822). *Didynamia Angiospermia*. "Enumeratio Plantarum Horti Regnii Berolinensis altera", part 2. (G. Reimer: Berlin).
- Linnaeus, C. (1753). "Species Plantarum" edn 1, Vol. 2: 602–639. (Laurentius Salvius: Stockholm).
- Linnaeus, C. (1759). "Systema Naturae ...", edn 10, Vol. 2: 1121. (Laurentius Salvius: Stockholm).
- Linnaeus, C. (1763). "Species Plantarum", edn 2, Vol. 2: 888. (Laurentius Salvius: Stockholm).
- Lopez-Palacios, S. (1977). Verbenaceae. "Flora de Venezuela", p.p. 18–654. (Universidad de Los Andes: Mérida, Venezuela).
- Lord, E.E. & Willis, J.H. (1982). "Shrubs and Trees for Australian Gardens", edn 5. (Lothian Publishing Co.: Melbourne).
- Melchior, H. (1964). Tubiflorae. In Melchior, H. "Englers Syllabus der Pflanzenfamilien", edn 12, Vol. 2: 424–471. (Borntraeger Brothers: Berlin).
- Merck, N.J. (1940). "The Merck Index", edn 5: 208. (Merck & Co. Inc.: Rahway).

- Moldenke, H.N. (1939). The Verbenaceae and Avicenniaceae of Trinidad and Tobago. *Lilloa* 4: 283–336.
- Moldenke, H.N. (1940). The Eriocaulaceae, Verbenaceae and Avicenniaceae of the Yucatan Peninsula. *Publ. Carnegie Inst. Wash.* 522: 148–223.
- Moldenke, H.N. (1959). "A Résumé of the Verbenaceae, Avicenniaceae, Stilbaceae, Symphoremaceae and Eriocaulaceae of the World as to valid Taxa. Geographic Distribution and Synonymy". (H.N. Moldenke: Mountain, New Jersey).
- Moldenke, H.N. (1971). "A Fifth Summary of the Verbenaceae, Avicenniaceae, Stilbaceae, Dicrostylidaceae, Symphoremaceae, Nyctanthaceae and Eriocaulaceae of the World ..." etc. 1 & 2. (H.N. Moldenke: Wayne, New Jersey).
- Moldenke, H.N. (1973). Verbenaceae. Flora of Panama. *Ann. Missouri Bot. Gard.* 60(1): 41–148.
- Moldenke, H.N. (1980). "Phytologia Memoirs. II. A Sixth Summary of the Verbenaceae, Avicenniaceae, Stilbaceae, Chloanthaceae, Symphoremaceae, Nyctanthaceae, and Eriocaulaceae of the World ..." etc. (H.N. & A.L. Moldenke: Plainfield, New Jersey).
- Moldenke, H.N. (1983). Verbenaceae. In Dassanayake, M.D. & Fosberg, F.A. "A Revised Handbook to the Flora of Ceylon", Vol. 4: 196–487. (Amerind Publishing Co.: New Delhi).
- Munir, A.A. (1982). A taxonomic revision of the genus *Callicarpa* L. (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 6(1): 5–39.
- Munir, A.A. (1984a). A taxonomic revision of the genus *Premna* L. (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 7(1): 1–43.
- Munir, A.A. (1984b). A taxonomic revision of the genus *Gmelina* L. (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 7(1): 91–116.
- Munir, A.A. (1985). A taxonomic revision of the genus *Viticipremna* H.J.Lam. *J. Adelaide Bot. Gard.* 7(2): 181–200.
- Munir, A.A. (1987a). A taxonomic revision of the genus *Vitex* L. (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 10(1): 31–79.
- Munir, A.A. (1987b). A taxonomic revision of the genus *Faradaya* F.Muell. (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 10(2): 165–177.
- Munir, A.A. (1989). A taxonomic revision of the genus *Clerodendrum* L. (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 11(2): 101–173.
- Munir, A.A. (1990a). A taxonomic revision of the genus *Glossocarya* Wallich ex Griffith (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 13: 17–34.
- Munir, A.A. (1990b). A taxonomic revision of the genus *Huxleya* Ewart (Verbenaceae). *J. Adelaide Bot. Gard.* 13: 35–41.
- Munir, A.A. (1991). A taxonomic revision of the genus *Oncinocalyx* F.Muell. (Verbenaceae). *J. Adelaide Bot. Gard.* 14(1): 77–84.
- Munir, A.A. (1992). A taxonomic revision of the genus *Stachytarpheta* M.Vahl (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 14(2): 133–168.
- Munir, A.A. (1993a). A taxonomic revision of the genus *Phyla* Lour. (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 15(2): 109–128.
- Munir, A.A. (1993b). A taxonomic revision of the genus *Lippia* [Houst. ex] L. (Verbenaceae) in Australia. *J. Adelaide Bot. Gard.* 15(2): 129–145.
- Murray, J.A. (1774). "Caroli à Linné ... Systema Vegetabilium ..." etc. (J.C. Dietrich: Göttingen).
- Necker, N.J.de (1790). "Elementa Botanica Genera Genuina, Species Naturales Omnium Vegetabilium ..." (Societas Typographica: Neowedae ad Rhenum).
- Persoon, C.H. (1797). "Caroli à Linné ... Systema Vegetabilium ..." etc. (J.C. Dietrich: Göttingen).
- Persoon, C.H. (1807). Didymia Angiospermia. "Synopsis Plantarum", Vol. 2: 138–182. (J.C. Cotta: Tübingen).
- Plumier, C. (1703). "Nova Plantarum Americanarum Genera", p. 30. (Joannem Boudot: Paris).
- Polhill, R.M. & Stearn, W.T. (1976). Linnaeus' notes on Plumier's drawings with special reference to *Mimosa latisiliqua*. *Taxon* 25: 323–325.
- Post, T.V. & Kuntze, O. (1904). "Lexicon Generum Phanerogamorum". (Deutsche Verlags-Anstalt: Stuttgart).
- Prairie, D. (1903). Verbenaceae. "Bengal Plants", Vol. 2: 614–626. Reprint edn. 1963. (Gourang Press Private Ltd: Calcutta).
- Raj, B. (1983). A contribution to the pollen morphology of Verbenaceae. *Rev. Palaeobot. & Palynol.* 39: 343–422.
- Reichard, J.J. (1778). Didymia Angiospermia. "Caroli à Linné Genera Plantarum". Edn 7. (Varrentrapp: Frankfurt a/M).
- Reichenbach, H.G.L. (1828). Labiatae. "Conspectus Regni Vegetabilis per Gradus naturales evoluti", part 1: 115–117. (Carolus Cnobloch: Leipzig).
- Rüling, J.P. (1774). Ringentes Antirrhina. "Ordines Naturales Plantarum Commentatio Botanica", p. 50. (A. Vandenhoeck: Göttingen).
- Sanders, R.W. (1984). Provisional synopsis of the species and natural hybrids in *Duranta* (Verbenaceae). *Sida*, 10(4): 308–318.
- Sanders, R.W. (1989). *Duranta* L. In Howard, R.A. "Flora of the Lesser Antilles". Dicotyledoneae 3: 224–232. (Harvard University: Massachusetts).
- Santapau, H. (1960). The flora of Khandala on the Western Ghats of India. *Rec. Bot. Surv. Ind.* edn 2, 16(1): 187–191.
- Schauer, J.C. (1847). Verbenaceae. In De Candolle, A. "Prodromus Systematis Naturalis Regni Vegetabilis", Vol. 11: 522–700. (Victoris Masson: Paris).

A.A. Munir

- Schreber, J.C.D. (1791). *Didynamia Angiospermia*. "Caroli à Linné ... Genera Plantarum ..." edn 8, Vol. 2: 400–431. (Varentrapp & Wenner: Frankfurt a/M).
- Scopoli, G.A. (1777). *Personatae*. "Introductio ad Historiam naturalem sistens Genera Lapidum et Animalium". (W. Gerle: Prague).
- Sharma, A.K. & Mukhopadhyay, S. (1963). Cytotaxonomic investigation with the aid of an improved method of the family Verbenaceae with special reference to the lines of evolution. *J. Genet. (belgoria)* 58: 358–386.
- Sims, J. (1815). *Duranta ellisia*. *Curtis' Bot. Mag.*, 41, t.1759.
- Smith, A.C. (1991). Verbenaceae. "Flora Vitiensis Nova". Vol. 5: 162–216. (National Tropical Botanical Garden: Lawai, Hawaii).
- Spach, E. (1840). Verbenaceae. "Histoire Naturelle des Végétaux Phanérogams", Vol. 9: 225–243. (Librarie Encyclopedique de Roret: Paris).
- Sprengel, K. (1825). *Didynamia Angiospermia*. "Caroli à Linné ... Systema Vegetabilium", edn 16, Vol. 2: 747–765. (Dietrich: Göttingen).
- Stafleu, F.A. & Cowan, R.S. (1976). "Taxonomic Literature", Vol. 1: A–G. (Bohn, Scheltema & Holkema: Utrecht).
- Stafleu, F.A. & Cowan, R.S. (1983). "Taxonomic Literature", Vol. 4: P–Sak. (Bohn, Scheltema & Holkema: Utrecht).
- Standley, P.C. (1924). Verbenaceae. Trees and shrubs of Mexico. *Contr. U. S. Natl. Herb.* 23(4): 1234–1251.
- Stanley, T.D. (1986). Verbenaceae. In Stanley, T.D. & Ross, E.M. "Flora of South-Eastern Queensland", Vol. 2: 364–374. (Queensland Department of Primary Industries: Brisbane).
- Ventenat, E.P. (1799). Pyrenaceae. "Tableau du Règne Végétal", Vol. 2: 231–240. (F. Hofmeister: Leipzig).
- Verdcourt, B. (1992). Verbenaceae. In Polhill, R.M. "Flora of Tropical East Africa", p.p. 1–155. (A.A. Balkema: Rotterdam).
- Walpers, W.G. (1845). Verbenaceae. "Repertorium Botanices Systematicae", Vol. 4, p.p. 3–134. (F. Hofmeister: Leipzig).
- Webb, L.J. (1948). Guide to the medicinal and poisonous plants of Queensland. *Bull. Council Sci. Industr. Res.* 232: 7–202.
- Willdenow, C.L. (1800). *Didynamia Angiospermia*. "Caroli à Linné ... Species Plantarum Exhibentes Plantas Rite cognitatas ad Genera Relatas ...", Vol. 3: 185–403. (G.V. Nauk: Berlin).

Index to Scientific Names

Names: New names and combinations are in **bold**. Synonyms, misapplied, misspelt, illegitimate or invalid names are in *italics*.

Page numbers: Page numbers in **bold** refer to main taxonomic treatment. Page numbers asterisked refer to figures and maps.

- | | | |
|-----------------------------------|----------------------------------|----------------------|
| <i>Castorea</i> 3, 5 | <i>var. ellisia</i> 6, 12 | PERSONATAE 1 |
| <i>racemosa</i> 5, 7 | <i>f. variegata</i> 12 | PERSONATAR 1 |
| <i>repens</i> 7 | <i>var. glabra</i> 6 | PLASYRGOPHYTUM 1 |
| <i>spinosa</i> 7 | <i>var. normalis</i> 12 | PLUMIERI 1 |
| CENTURIA QUARTA 14 | <i>var. strigillosa</i> 6 | PYRENACEAE 1 |
| Citharexylum 4 | <i>racemosa</i> 6 | Rhaphithamnus 4 |
| DIDYNAMIA | <i>repens</i> 1–5, 7, 10, 12, 13 | RINGENTES ANTIRRHINA |
| ANGIOSPERMIA 1, 14 | <i>var. alba</i> 6 | 1 |
| <i>Duranta</i> 1, 2–4, 7, 13 | <i>var. canescens</i> 6 | VERBENACEAE 1, 2, 13 |
| <i>bonardi</i> 6 | <i>var. lopez-palacii</i> 6 | :AEGIPHILEAE 1 |
| <i>dentata</i> 6 | <i>var. microphylla</i> 6 | :AVICENNIEAE 1 |
| <i>ellisia</i> 5, 6, 12 | <i>var. serrata</i> 6 | :CASSELIEAE 1 |
| <i>erecta</i> 1, 2–5, 7, 8*, 10*, | <i>rostrata</i> 6 | :CITHAREXYLEAE 1 |
| 11*–13 | <i>spinosa</i> 10 | :DURANTEAE 1 |
| <i>var. alba</i> 6, 13 | <i>stenostachya</i> 13 | :EUVERBENEAE 1 |
| <i>var. microphylla</i> 13 | <i>turbinata</i> 6 | :LANTANEAE 1 |
| <i>inermis</i> 7, 10 | <i>xalapensis</i> 6 | :LIPPIAE 1 |
| <i>integrifolia</i> 6 | <i>Durantea</i> 2 | :MONOCHILEAE 1 |
| <i>latifolia</i> 6 | <i>Durantia</i> 2 | :PETRAEEAE 1 |
| <i>macrocarpa</i> 6 | <i>racemosa</i> 6 | :PETREEAE 1 |
| <i>macrophylla</i> 6 | <i>Ellisia</i> 3 | :SPIELMANNIEAE 1 |
| <i>microphylla</i> 6 | <i>acuta</i> 5 | :VERBENAE 1 |
| <i>mutisii</i> 13 | <i>frutescens</i> 3, 5 | :VERBENEAE 1 |
| <i>parviflora</i> 6 | LABIATAE 1 | :VERBENOIDEAE 1 |
| <i>peruviana</i> 6, 13 | Lantana 4 | :VITICEAE 1 |
| <i>var. longipedicellata</i> 6 | Leucaena 14 | :VITICES 1, 14 |
| <i>plumieri</i> 1, 2, 4–6, 10, 12 | Lysiloma 14 | |
| <i>var. alba</i> 6, 12 | PETALOSTEMONUM 1 | |